SECTION 4.06 - BITUMINOUS CONCRETE

Article 4.06.03 - Construction Methods, Subarticle 6 - Surface Tolerance, is amended as follows:

After the following after paragraph:

(a) Pavement Smoothness (Rideability): The Engineer shall evaluate the final pavement surface for smoothness as stated herein. This provision will apply to projects requiring a minimum of two (2) courses of Hot Mix Asphalt (HMA) in which the compacted depth of each is 1.5 inches (40 mm) or greater. The data is collected and calculated in metric units and shall not be converted to English units for adjustment purposes.

Prior to the placement of the final course of pavement, the Engineer will furnish the Contractor with an International Roughness Index (IRI) value that results from the Engineer's evaluation of the material placed to date. The actual time of this "trial" evaluation will be coordinated between the Engineer and the Contractor. This evaluation will be limited to one (1) test in each direction of travel. The IRI value will serve as a guide to the Contractor in evaluating his current level of conformance with the smoothness specification.

The International Roughness Index (IRI) value for the final course of pavement will be the basis for determining any payment adjustment(s) in accordance with Subarticle 4.06.04-E Rideability Adjustment.

Evaluation Method - The final pavement surface shall be evaluated for smoothness using an "Automatic Road Analyzer" vehicle (ARAN). Computers aboard the ARAN contain software that simulates the traversing of a so-called "quarter car" over the adjusted profile, and calculates an average IRI value as defined by the World Bank, for each lane of travel over the project. This ARAN is a Class II device as defined by the World Bank. The IRI represents the vertical (upward and downward) displacement that a passenger would experience traveling at 48 MPH (77 km/hr) in a standard vehicle over the profile established by the device. A zero IRI value would indicate a perfectly smooth pavement surface, while increasing IRI values would correspond to an increasingly rough pavement surface. The ARAN has the capability to measure longitudinal profile in each wheelpath simultaneously. IRI values shall be calculated in meters of vertical displacement every 10 meters and normalized over one (1) kilometer.

Each lane of the final pavement surface will be divided into 160-meter segments. Any segment less than 160 meters in length will be represented as a partial segment. An IRI value will be calculated for each segment using the average of both wheelpaths. The IRI value for any partial segments will be weighted accordingly.

The evaluation shall be subject to the following:

1. Only mainline travel lanes will be evaluated. This shall include climbing lanes, operational lanes, and turning roadways that are 644 meters or greater in length.

2. Smoothness data will not be computed for the following project sections:

- Climbing and operational lanes and turning roadways less than 644 meters in length
- Acceleration and deceleration lanes
- Shoulders and gore areas
- Pavement on horizontal curves which have a 274.32 meters or less centerline radius of curvature, and pavement within the superelevation transition of these curves.

3. Bridge decks shall be included **only** if they are paved as part of the project.

4. Ramps are specifically excluded from the requirements of this section.

5. Measurement will start 30 meters prior to and end 30 meters after the transverse construction joints at the project limits.

6. Data will be collected within 30 days of completion of the entire final course of pavement, or within 30 days of completion of any corrective work on the pavement. The Contractor, at its own expense, will be allowed to correct any areas prior to the collection of data. The Contractor shall notify the Engineer in writing of its intent to do so along with a proposed schedule for corrective work that includes an anticipated date that data collection can be performed. The completion of the entire final course of pavement and/or any corrective work includes all associated work such as pavement markings, sawing and sealing of joints, and installation of bridge asphaltic plug joints.

If paving cannot be completed prior to December 1 (winter shutdown), the data will be collected for any portion of the roadway in which the **final** course of pavement has been placed. These data will be saved and stored by the Department. Once the remainder of the final course has been placed, these data will be collected and combined with the data taken previously.

7. No testing shall be conducted during rain or under other conditions deemed unacceptable by the Engineer. During testing, the roadway must be free of moisture and other deleterious materials, which might affect the evaluation. Any work associated with preparing the roadway for the evaluation, such as but not limited to sweeping, will not be measured for payment.

Article 4.06.04 - Method of Measurement:

Add the following Subarticle:

E- Rideability Adjustment: An adjustment for pavement smoothness will be applied to the total quantity of the top two (2) lifts of HMA pavement, excluding

ramps. The adjustment value will be based on the IRI, according to the following.

An average IRI **($AIRI_{sx}$)** value shall be computed for each 160-meter segment of a lane. Each segment average IRI value **($AIRI_{sx}$)** shall then be classified into one of the five IRI ranges shown in Table 1 and the applicable payment factor **(PF)** value derived. The payment factor shall be multiplied by the length of the segment (L_{sx}) to compute a segment adjustment factor **(AF_{sx})**. The Rideability Adjustment **(RA)** is determined by taking the sum of all the segment adjustment factors and dividing by the sum of lengths of segments for the project. The following method shall be used for computing the Rideability Adjustment:

$$RA = \left[\frac{(AF_{s1} + AF_{s2} + AF_{s3} \ldots AF_{sx})}{(L_{s1} + L_{s2} + L_{s3} + \ldots L_{sx})} \right] - 100 \qquad \text{where} \quad AF_{sx} = (PF)(L_{sx})$$

where: **RA** =Rideability Adjustment for complete lane
AF_{sx} =Adjustment factor for each segment (x)
PF = Pay factor value derived by evaluating $AIRI_{sx}$ in Table 1
L_{sx} =Length of applicable segment (160 meters unless otherwise noted)

TABLE 1
ADJUSTMENT SCHEDULE

IRI (meters per kilometer)	PAY FACTOR (PF)
<0.789	10
0.789-0.947	63.29 (0.947-IRI)
0.948-1.262	0
1.263-1.893	39.68 (1.263-IRI)
>1.893	- 50

Article 4.06.05 Basis of Payment, Subarticle "2. Adjustments" is amended as follows:

Delete first sentence and replace with following:

Contract items will be incorporated by construction order for material deficiency, density and rideability adjustments as measured in Subarticle 4.06.04-1C thru 1E.

Insert after section titled "2. Density Adjustment (DA)"

3. Rideability Adjustment (RA): The quantity of tons (metric tons) measured in Subarticle 4.06.04-1E will be used to determine the adjustment value and will be calculated as follows:

RA Tons (metric tons) X Contract Unit Price = RA Adjustment

Adjustments for rideability **shall not be made** for those areas reviewed and determined by the Engineer to be defective and requiring the removal and replacement of the pavement as stipulated in 1.05.11, 1.06.04. and 4.06.03-8. An area shall be defined as an entire segment for purposes of exclusion from any adjustment for rideability.